Probability Checkpoint 1

Question (1:q1)

A family plans to have 3 children. For each birth, assume that the probability of a boy is the same as the probability of a girl. What is the probability that they will have at least one boy and at least one girl?

A: 0.5

B: 0.125

C: 0.75

D: 0.875

E: None of these

Feedback

A : 0

✗ Not quite right. There are 8 equally likely outcomes in this sample space. In two outcomes the gender of all three children is the same (GGG, BBB). The other 6 outcomes contain at least one boy and one girl. So the answer is 6/8 = 0.75. The correct answer is (C).

B : 0

✗ Not quite right. The outcomes are equally likely, so the easiest way to work this problem is to write out the 8 outcomes in this sample space. In two outcomes the gender of all three children is the same (GGG, BBB). The other 6 outcomes contain at least one boy and one girl. So the answer is 6/8 = 0.75. The correct answer is (C).

C : 10

✓ Good job! The outcomes are equally likely, so the easiest way to work this problem is to write out the 8 outcomes in this sample space. In two outcomes the gender of all three children is the same (GGG, BBB). The other 6 outcomes contain at least one boy and one girl. So the answer is 6/8 = 0.75.

D : 0

✗ Not quite right. You may have calculated P(at least one girl) = 1-(0.5)^3. The outcomes are equally likely, so the easiest way to work this problem is to write out the 8 outcomes in this sample space. In two outcomes the gender of all three children is the same (GGG, BBB). The other 6 outcomes contain at least one boy and one girl. So the answer is 6/8 = 0.75. The correct answer is (C).

E : 0

✗ Not quite right. The outcomes are equally likely, so the easiest way to work this problem is to write out the 8 outcomes in this sample space. In two outcomes the gender of all three children is the same (GGG, BBB). The other 6 outcomes contain at least one boy and one girl. So the answer is 6/8 = 0.75. The correct answer is (C).

Question (2:q2)

A person in a casino decides to play blackjack until he wins a game, but he will not play more than 3 games. Let W denote a win and L denote a loss. What is the sample space for this random experiment?

A: S = {WWW, WWL, WLW, , WLL, LWW, LWL, LLW, LLL}

B: S = {W, LW, LLW}

C: S = {W, LW, LLW, LLL}

D: S = {W, WW, WWW}

E: S = {W, WL, WWL, WWW}

Feedback

A : 0

✗ Not quite right. The person stops playing when he wins or if he plays three games without winning. So not all of the options in this set are outcomes for this experiment (for example WWW is not possible) and other

possibilities are missing (for example W). The correct answer is (C).

B : 0

Not quite right. One option is missing. The person could also lose all 3 games. The correct answer is (C).

C : 10

Good job! The person stops playing when he wins or if he plays three games without winning.

D : 0

Not quite right. The person stops playing when he wins a game, so WW and WWW are not outcomes for this random experiment. The correct answer is (C).

E : 0

Not quite right. The person stops playing when he wins a game, so W is the only outcome in this set that comes

from this random experiment. The correct answer is (C).

Question (3:q3)

A person in a casino decides to play 3 games of blackjack. Let W denote a win and L denote a loss. Define the event A as "the person wins at least one game of blackjack". What are the possible outcomes for this event?

A: {W, LW, LLW}

B: {W, WW, WWW}

C: {WWW, WWL, WLW, WLL, LWW, LWL, LLW, LLL}

D: {WWW, WWL, WLW, WLL, LWW, LWL, LLW}

E: {WWL, LWL, LLW}

Feedback

A : 0

✗ Not quite right. {W, LW, LLW} does not describe outcomes for this random experiment because the person decided to play 3 games (regardless of whether he wins or losses), so each outcome must show the result for each of the 3 games. The correct answer is (D).

B : 0

✗ Not quite right. {W, WW, WWW} does not describe outcomes for this random experiment because the person decided to play 3 games, so each outcome must show the result for each of the 3 games. The correct answer is (D).

C : 0

✗ Not quite right. This is the entire sample space for the random experiment in which a person plays 3 games of blackjack. The correct answer is (D).

D : 10

✓ Good job! Event A is all outcomes in the sample space

except LLL.

E : 0

✗ Not quite right. {WLL, LWL, LLW} are the outcomes for the event "wins EXACTLY one game of blackjack". The correct answer is (D).

Question (4:q4)

Four students attempt to register online at the same time for an Introductory Statistics class that is full. Two are freshmen and two are sophomores. They are put on a wait list. Prior to the start of the semester, two enrolled students drop the course, so the professor decides to randomly select two of the four wait list students and gives them a seat in the class.

What is the probability that both students selected are freshmen?

A: 1/2
B: 1/4
C: 1/6
D: 1/12
E: it is impossible to tell because the outcomes are not equally likely

Feedback

A : 0

✗ Not quite right. You may have been thinking that half of the wait list students are freshmen. But you need to think about the sample space of this random experiment. Since order does not matter, the sample space contains six equally likely outcomes. S={F1F2, F1S1, F1S2, F2S1, F2S2, S1S2}. Only one of the six outcomes is two freshmen. The correct answer is (C).

B : 0

✗ Not quite right. You may have been thinking that there are four possible outcomes, {FF, FS, SF, and SS}, like when we toss a coin two times. But here the sample space contains six equally likely outcomes because there are 2 freshmen and 2 sophomores and the order in which they are chosen does not matter. S={F1F2, F1S1, F1S2, F2S1, F2S2, S1S2}. Only one of the six outcomes is two freshmen. The correct answer is (C).

C : 10

✓ Good job! The order that the students are chosen does not matter, so F1F2 and F2F1 are the same outcome. Thus, the sample space contains six equally likely outcomes. S={F1F2, F1S1, F1S2, F2S1, F2S2, S1S2}. Only one of the six outcomes is two freshmen.

D : 0

✗ Not quite right. The order that the students are chosen does not matter, so F1F2 and F2F1 are the same outcome. Thus, the sample space contains only six equally likely outcomes. S={F1F2, F1S1, F1S2, F2S1, F2S2, S1S2}. Only one of the six outcomes is two freshmen. The correct answer is (C).

E : 0

✗ Not quite right. The students are chosen randomly, so the outcomes are equally likely. The order that the students are chosen does not matter, so F1F2 and F2F1 are the same outcome. Thus, the sample space contains six equally likely outcomes. S={F1F2, F1S1, F1S2, F2S1, F2S2, S1S2}. Only one of the six outcomes is two freshmen. The correct answer is (C).